

CLAIMS

What is claimed is:

Sub A 1. A diverter valve assembly for use in liquid chromatography comprising:

a unitarily formed valve body;

a plurality of ports in said valve body, at least one of said ports functioning as an inlet port for allowing liquid to enter into said valve body, at least one other of said ports functioning as an outlet port for allowing said liquid to exit said valve body, and at least two other ports which may function as either inlet or outlet ports with respect to said liquid after said liquid has entered said valve body;

a plurality of chambers in said valve body, each one of said chambers being associated with one of said ports;

a tortuous network of channels in communicating between said ports to and channels in said valve body for directing the flow of said liquid through said valve body; and

a plurality of diverter valves located in said valve body, said diverter valves operating to control the flow said liquid in said valve body, whereby when a predetermined combination of said ports, chambers, channels and diverter valves is actuated, said combination produces a smooth and unobstructed path for said liquid which substantially eliminates dead-legs in said valve assembly.

14

2. The diverter valve assembly of claim 1, wherein said valve body comprises an octahedral pyramid structure having:  
a substantially planar, octagonally shaped base portion;  
a substantially planar square top surface;  
four distorted hexagonal side faces projecting downwardly from said square top surface; and  
four triangular faces rising perpendicularly from said base portion, said triangular faces being disposed between said four side faces.

3. The diverter valve assembly of claim 2, wherein said ports are disposed on said triangular faces.

4. The diverter valve assembly of claim 3, wherein said plurality of ports is equal to four ports.

5. The diverter valve assembly of claim 1, wherein said at least two other ports are connected to opposite ends of a chromatography column.

6. The diverter valve assembly of claim 1, wherein said plurality of diverter valves is equal to five diverter valves.

7. The diverter valve assembly of claim 6, wherein one of said five diverter valves is disposed at a predetermined high

point in said valve body and the other four of said five diverter valves are disposed in said valve body at predetermined angles suitable for draining said valve assembly.

8. The diverter valve assembly of claim 7, wherein said angles are approximately  $22^{\circ}$ .

9. The diverter valve assembly of claim 1, further comprising a plurality of manual bonnets, each of said manual bonnets corresponding to a diverter valve disposed thereunder.

10. The diverter valve assembly of claim 9, wherein said manual bonnets operate to manually control the operation of said diverter valves.

11. A diverter valve assembly for use in a liquid chromatography system, comprising:

a unitarily formed valve body having a plurality of chambers and a tortuous network of passageways extending therethrough;

at least one inlet port connected to one of said plurality of chambers for receiving the flow of a liquid into said valve assembly;

at least one outlet port connected to one other of said plurality of chambers for allowing said liquid to exit said valve assembly;

Sub A2  
at least two additional ports connected to two other of said plurality of chambers for allowing the flow of liquid already in said valve assembly to exit and reenter said valve assembly without exiting into said chromatography system; and

a plurality of diverter valves interposed between said plurality of chambers and ports, whereby liquid flowing through said valve assembly is common to at least two of said plurality of diverter valves, said liquid following a smooth and unobstructed path through said valve assembly which allows a complete flushing of said valve assembly thereby eliminating dead-legs.

12. The diverter valve assembly of claim 11, wherein said at least two additional ports are connected to opposite ends of a chromatography column.

13. A unitarily formed diverter valve assembly for diverting the flow of fluids in a liquid chromatography system comprising:

first, second, third, and fourth ports;

first, second, third and fourth chambers; and

first, second, third, fourth and fifth diverter valves;

wherein said first port is associated with said first chamber, said second port is associated with said second chamber,

said third port is associated with said third chamber, and said fourth port is associated with said fourth chamber; and

wherein said first diverter valve is disposed between said first and said second chamber, said second diverter valve is disposed between said second and said third chamber, said third diverter valve is disposed between said third and said fourth chamber, said fourth diverter valve is disposed between said fourth and said first chamber, and said fifth diverter valve is disposed between said first and said third chamber.

14. The diverter valve assembly of claim 13, wherein fluid flowing in a first direction enters said valve assembly through said first port, passes through said first chamber, is directed across said first diverter valve into said second chamber, exits said valve assembly through said second port, reenters said valve assembly through said fourth port, passes through said fourth chamber, is directed across said third diverter valve, passes through said third chamber, and exists said valve assembly through said third port.

15. The diverter valve assembly of claim 14, wherein said second diverter valve operates to prevent fluid communication between said second and said third chamber, said fourth diverter valve operates to prevent fluid communication between said fourth and said first chamber, and said fifth diverter valve operates to

20

prevent fluid communication between said first and said third chamber.

16. The diverter valve assembly of claim 13, wherein fluid flowing in a second direction enters said valve assembly through said first port, passes through said first chamber, is directed across said fourth diverter valve into said fourth chamber, exits said valve assembly through said fourth port, reenters said valve assembly through said second port, passes through said second chamber, is directed across said second diverter valve, passes through said third chamber, and exists said valve assembly through said third port.

17. The diverter valve assembly of claim 16, wherein said first diverter valve operates to prevent fluid communication between said first and said second chamber, said third diverter valve operates to prevent fluid communication between said third and said fourth chamber, and said fifth diverter valve operates to prevent fluid communication between said first and said third chamber.

18. The diverter valve assembly of claim 13, wherein fluid flowing in a third direction enters said valve assembly through said first port, passes through said first chamber, is directed

across said fifth diverter valve into said third chamber, and exits said valve assembly through said third port.

19. The diverter valve assembly of claim 18, wherein said first diverter valve operates to prevent fluid communication between said first and said second chamber, said second diverter valve operates to prevent fluid communication between third and said second chamber, said fourth diverter valve operates to prevent fluid communication between said third and said fourth chamber, and said fourth diverter valve operates to prevent fluid communication between said first and said fourth chamber.

20. The valve assembly of claim 13, wherein said second port and said fourth port are connected to opposite ends of a chromatography column.